

# GENERAL RADIO COMPANY

## service department



### TESTING SPECIFICATIONS

August, 1959

Type 1106-A, B, C, Frequency Transfer  
Units Pre-Calibration Test

22 Baker Avenue  
West Concord, Mass.

#### Test Equipment

- 1 - Volt-Ohmmeter
- 1 - Voltmeter-Wattmeter-Variac Unit
- 1 - Headphones
- 1 - Type 1800-B Vacuum-Tube Voltmeter, or equivalent
- 1 - Type 1108-A Coupling Panel
- 1 - Type 1932-A Distortion and Noise Meter, or equivalent
- 1 - Type 805-C Signal Generator, or equivalent

Type 1106-A, B, C Pre-calibration test (refers to 1106-A, B, and C unless otherwise stated).

#### 1.0 Ohmmeter checks: Input Power

Apply 115 V power. Input Power must be 38-40 watts. OD3 must glow. Detector Range window must be illuminated. Frequency Meter window must be dark when PLATE-switch is OFF, illuminated when PLATE-switch is ON.

#### 2.0 Range Switch Test

Check each of the 20 (18) Range Switch positions (10 Frequency Meter positions and 10 Detector positions) for proper operation. These can be done in pairs by connecting the Frequency Meter output to the Detector input, tuning for an audible beat note (in the Detector output) on each of the 10 frequency ranges, and rocking each switch, in turn, back and forth. There must be no erratic behavior either as to frequency, or as to amplitude of the detector output.

#### 3.0 Range Span Test

3.1 Check the top (highest) range of the detector for oscillation throughout the range. In the case of the 1106-C only, the Type 1108-A must be connected via the proper cables (R-5, R-8, and R-9) for this test. Monitor aurally at detector output terminals. For non-oscillation, of the 1106-C only, change R-30 to 56,000 ohms or add 47 ohms to detector input. In all cases, check for audible tuning noise on top range of DETECTOR.

3.2 On any Frequency Meter range, check for continuous oscillation from end to end of the range. Monitor by means of a Type 1800-B Voltmeter connected to the Frequency Meter output.



#### 4.0 Frequency Meter Output

Connect Type 1800-B to the specified Frequency Meter Output plug and obtain the following outputs at the Low Frequency (counterclockwise) end of the range. (Range 1 is CCW). Output control on 1106 panel must be set fully clockwise.

|         | 1106-A                        | 1106-B                        | 1106-C #1                     | 1106-C #2                       |
|---------|-------------------------------|-------------------------------|-------------------------------|---------------------------------|
| Range 1 | .4 to .65 V                   | .24                           | Readable output               | 3.0 V                           |
| Range 2 | .4 to .65 V                   | .23                           | around                        | 2.5 V                           |
| Range 3 | .4 to .65 V                   | .22                           | .1 volt                       | 2.0 V                           |
|         | Varies with<br>output control | Varies with<br>output control | Varies with<br>output control | Unaffected by<br>output control |

#### 5.0 Noise and Hum Measurements

##### 5.1 Audio amplifier, 1106-A, B, and C.

Set the regeneration control fully CCW, connect the detector output to a Type 1932-A Distortion and Noise Meter, set to NOISE 100 K ohm input, with its CAL control fully clockwise. Monitor the output of the 1932-A with phones. The 1106 may be set to any range.

The noise (hum) as measured by the Type 1932-A must be -31db or lower (6J5 tube) (1106 bottom dust cover must be in place).

Tap the 1106 gently to detect excessive microphonics or noise in the 6J5 tube. Reject tubes that are abnormal in this respect. (An approximate noise figure of -30db may be used as a maximum allowable for this test; however, the figure depends on how hard the 1106 is tapped.)

##### 5.2 Detector

Set the 1106 (A, B, or C) to its highest (CW) range, with the vernier tuning control near its CCW extreme.

Adjust the regeneration control for maximum sensitivity, oscillating and non-oscillating.

The noise as measured by the 1932-A, set up as in 5.1 above must be:

|         |               |
|---------|---------------|
| 1106-A: | -26db or less |
| 1106-B: | -19db or less |
| 1106-C: | -24db or less |

Tap the 1106 gently to detect excessive microphonics or noise in the detector tube, (6SJ7 in 1106-A and B; 9002 in 1106-C). Reject tubes that are abnormal.



1106-B and C only:

Rock the tuning control of the 1106 back and forth several times, while monitoring the noise level. The increase in noise level, due to tuning only, must not exceed 4db.

## 6.0 Detector Sensitivity

Apply signals from the Type 805-C Signal Generator at the levels and frequencies tabulated below to the 1106 Detector Input Terminals. Across the Detector Output Terminals, connect the Type 1800-B VTVM, and headphones. In all cases set detector to range 8, tune to the signal and obtain a beat note of about 1kc (monitored aurally). By proper adjustment of the regeneration controls, it must be possible to obtain at least 2 volts of audio output.

| <u>Type No.</u> |              | <u>Test Frequency</u> | <u>Signal Level</u> |
|-----------------|--------------|-----------------------|---------------------|
| 1106-A          | Normal Ratio | 1Mc                   | 500 microvolts      |
| 1106-B          |              | 5Mc                   | 100 microvolts      |
| 1106-C          | 1:100 Ratio  | 50Mc                  | 90 microvolts       |

6.1 For trouble-shooting purposes on the 1106-C only, the following data is supplied. Measurements were made on an 1106-C whose sensitivity (per A.M.W.) was adequate. Output was measured by a Type 1932-A Distortion and Noise Meter (100 K ohm Noise), and the figures represent the signal levels required to produce a beat note 6db above detector noise level. A Type 874-GF 20 db pad was used between signal generator and detector input. Measurements were made at the high end of each range, as follows:

| <u>Range</u> | <u>Freq. Mc</u> |         | <u>Sig. Gen<br/>Output</u> | <u>1106-C<br/>Input</u> |
|--------------|-----------------|---------|----------------------------|-------------------------|
| 1            | 12.5            | 805-C   | 480 $\mu$ v                | 48 $\mu$ v              |
| 2            | 16.0            | 805-C   | 400 $\mu$ v                | 40 $\mu$ v              |
| 3            | 20.0            | 805-C   | 130 $\mu$ v                | 13 $\mu$ v              |
| 4            | 25.0            | 805-C   | 120 $\mu$ v                | 12 $\mu$ v              |
| 5            | 32.0            | 805-C   | 70 $\mu$ v                 | 7 $\mu$ v               |
| 6            | 40.0            | 805-C   | 110 $\mu$ v                | 11 $\mu$ v              |
| 7            | 50.0            | 1021-AV | 90 $\mu$ v                 | 9 $\mu$ v               |
| 8            | 63.0            | 1021-AV | 30 $\mu$ v                 | 3 $\mu$ v               |
| 9            | 80.0            | 1021-AV | 30 $\mu$ v                 | 3 $\mu$ v               |
| 10           | 100.0           | 1021-AV | 20 $\mu$ v                 | 2 $\mu$ v               |

Service Department

There are many reasons for the high cost of the project, which is the main reason for the high cost of the project.

The project is a very large and complex one, and it is very difficult to estimate the cost of the project. The project is a very large and complex one, and it is very difficult to estimate the cost of the project.

| Item         | Quantity | Unit Price | Total Price |
|--------------|----------|------------|-------------|
| 1. Labor     | 1000     | \$10.00    | \$10000.00  |
| 2. Material  | 500      | \$20.00    | \$10000.00  |
| 3. Equipment | 100      | \$100.00   | \$10000.00  |

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TESTING SPECIFICATIONS

August, 1959

Type 1107-A Interpolation Oscillator

22 Baker Avenue  
West Concord, Mass.

### Test Equipment

- 1 - Ohmmeter-Voltmeter
- 1 - Wattmeter-Voltmeter-Variac Unit
- 1 - Type 1800-B Vacuum-Tube Voltmeter, or equivalent
- 1 - Type 1107-A Interpolation Oscillator
- 1 - Cathode Ray Oscillograph
- 1 - Laboratory Circular Sweep Unit
- Standard Frequency Lines
- Feeler Gauge .032"

### 1.0 Preliminary Checks

#### 1.1 Check between the following points with the ohmmeter:

Power socket terminals and ground - open circuit.  
Center terminal of the panel OUTPUT jack to the center terminal of the OUTPUT plug (rear of chassis) - direct connection.  
Center terminal of the panel INPUT jack to the center terminal of the INPUT plug (rear of chassis) - direct connection.

#### 1.2 Check the plate alignment of the following condensers:

Panel controls DIRECT C-12 and REVERSE C-9  
Panel trimmers C-8 and C-10 (under DIRECT-REVERSE switch)  
Trimmer C-11 (rear of panel)

Set condensers C-8 and C-10 at  $\frac{1}{2}$  capacity (clockwise rotation to decrease capacity), and C-11 at maximum capacitance.

#### 1.3 Connect the Type 1107-A to the Wattmeter-Voltmeter-Variac unit and turn the power switch to ON. Set the line voltage at 115 and note that the wattmeter reads approximately 55 watts.

Set potentiometers R-3, R-5, R-8, and R-15 at their approximate center.

### 2.0 Condenser Worm Linearity and Backlash

#### 2.1 Check that the spacing of the movable stator plate (top of the condenser) is .032". The segments on the serrated plate must be set at normal plate spacing.



Set up a Type 1107-A instrument with a cathode ray oscillograph and standard frequencies.

For the following checks use the Type 1107-A instrument output signal from across the meter leads. Set the DIRECT-REVERSE switch at the DIRECT position for the condenser calibration and use the lower scale of the dial drum for the frequency readings.

Connect the "high" terminal of the freq. tuning condenser by a rigid lead to the insulated terminal directly behind the variable oscillator inductor shield can of the Type 1107-A. Ground the condenser frame to the instrument chassis.

Set the frequency of the Type 1107-A to zero, the OUTPUT control at maximum and adjust condenser C-27 (r-f filter unit) for a minimum thickness of line, as noted on the cathode ray tube screen.

Check the condenser for backlash at the 0, 400, 425, 450, 475, 500, 1000, 2000, 3000, 4000, and 5000 scale divisions. The backlash must not exceed 0.25 divisions on the vernier scale. Slight adjustment of the spring tension at the rear worm bearing may be necessary to correct excessive backlash.

Set the trimmer condensers C-21 and C-22 (mounted on the main tuning condenser) to  $\frac{1}{2}$  mesh, the main tuning condenser to the frequency scale zero, and adjust the panel trimmer condenser C-10 to bring the output frequency to zero. Reset the tuning condenser to give a frequency of 5000 cycles, and note the divisions difference between the dial reading and the 5000 dial line. Multiply this scale difference by 2.5, and reset the condenser for a dial reading on the opposite side of the 5000 line equal to the amount of the product. Retune for a 5000-cycle output frequency by means of condenser C-21 (large trimmer). Reset the tuning condenser to the zero dial division and condenser C-10 for zero frequency. Recheck the dial reading to 5000 cycles. Repeat the above procedure (using the factor 2.5) until the frequency span from zero dial to 5000 dial readings of the main tuning condenser is 5000 cycles.

- 2.2 Set the condenser dial to 400 and adjust condenser C-10 for a frequency of 400 cycles. Tune the main frequency condenser for frequencies of 425, 450, 475, and 500 cycles, plotting the deviations in terms of 0.1 divisions. Variations in linearity must not exceed 0.25 divisions at 425, 450, and 475 cycles.

### 3.0 Main Condenser Calibration

- 3.1 Both variable and fixed sections must be electrically centered. Set the dial for an output frequency of 300 cycles. Start at the right-hand stator post of the fixed section and raise the stator plates slightly. If the 300-cycle frequency can be tuned at a lower dial reading, the adjustment has produced better centering; a higher reading indicates poorer plate centering. Further adjustment must be made until a minimum dial reading for the given frequency is obtained. Proceed in the same manner with the remaining stator posts of the



fixed and variable sections of the condenser. Do not readjust the movable stator plate previously adjusted (paragraph 2.1). Use caution when loosening a stator nut; the opposing nut must be tightened by the same amount to avoid stretching of stator post.

Remove the jumper that connects the variable stator plates to the fixed stator plates. Ground the variable stator section. Tune condenser C-10 for any convenient frequency and adjust each segment of the serrated plate for this frequency as the rotor is turned over the operating range. Resolder the jumper and remove the stator ground.

- 3.2 Readjust the frequency span (paragraph 2.1) using 200 cycles instead of 0 cycles as the lower adjusting frequency. Plot a preliminary curve every 500 cycles. The curve must not show deviations greater than 25 cycles. Should the deviation at the low end of the preliminary curve be greater than 1 cycle per 100 vernier divisions or the maximum deviation exceed 25 cycles, an adjustment of the compensating stator plate will be necessary.

Adjust condenser C-21 for a frequency of 5000 cycles at the 5000 dial division. Reset the dial at 2500 and move the single plate at the center stator the amount necessary to bring the frequency to 2500 cycles. Similarly, adjust the left stator post so that the frequency at 500 divisions is 500 cycles. Since these adjustments react with each other, they must be repeated.

Plot the frequency curve as before. The maximum deviation must be within 10 cycles or the stator post adjustments must be repeated.

Calibrate the frequency condenser by means of the slotted plate, adjusting each segment to bring the calibration within +2 cycles. Repeat the adjustment of each segment and slightly twist the end segments, if necessary, to bring the low and high ends of the scale within limits.

- 3.3 Assemble the side plate on the condenser. Do not replace the dust covers. Recheck the frequency dial. The calibration must read within +2 cycles between 0 and 5000 cycles, or readjustment of the frequency span must be made.
- 3.4 Adjust the screen potentiometer R-3 so that the r-f level at the high lead of coil L-2 is 2.5 volts. Similarly, potentiometer R-15 is adjusted so that the level at the high terminal of coil L-4 is 2.5 volts.

Install the bottom dust cover.

- 3.5 Vary the line voltage from 105 to 125, and note that the regulator tube V-9 operates over this range.

#### 4.0 Increment Condenser Calibration

- 4.1 Set the REVERSE-DIRECT switch to DIRECT, and the  $\Delta f$  DIRECT dial to zero, and tune the Type 1107-A under test to 400 cycles. Set the laboratory standard Type 1107-A to 4000 cycles and connect both interpolation



oscillators to the cathode-ray oscillograph and standard frequencies. The stator plates of the  $\Delta f$  DIRECT condenser must be set (with respect to the rotor) so that the frequency span (-10 to +10 cycles) agrees with the readings of the  $\Delta f$  DIRECT dial. A 10-cycle change of the instrument under test will be a 100-cycle change on the standard Type 1107-A. Final adjustments must show not more than +2 cycles error as read on the dial of the standard Type 1107-A. Readjustment of condenser C-10 will be necessary to compensate for the change of capacity of the DIRECT increment condenser.

- 4.2 Set the main frequency dial at 2500, the REVERSE-DIRECT switch at REVERSE, and adjust condenser C-8 for a frequency of 2500 cycles. Change the FREQUENCY dial to read 9600 (upper scale) and note that the output frequency is 400 cycles. Adjust the  $\Delta f$  REVERSE condenser in the same manner as above and to the same limits.

Recheck the 2500 and 7500 (REVERSE) dial readings to be 2500 cycles.

## 5.0 Equalizing Ranges

- 5.1 Set the DIRECT-REVERSE switch at DIRECT, the main dial at 2500, and the OUTPUT control at maximum. Connect the Type 1800-B Voltmeter to the output terminals, and adjust potentiometer R-5 for an output voltage of 15.0 volts. The panel meter will read off scale at this output voltage.

Turn the switch to REVERSE and adjust potentiometer R-8 to give the same output readings.

## 6.0 Hum Check

- 6.1 Set the frequency to 60 cycles, the INPUT control at off, and the OUTPUT control for full scale reading of the meter. When tuned approximately to the line frequency, the 60-cycle hum present will beat with the output frequency causing the meter pointer to swing slightly. The extent of this swing must not exceed 0.2 volts.

## 7.0 Sensitivity

- 7.1 Connect the OUTPUT terminals of the laboratory standard Type 1107-A to the INPUT terminals of the Type 1107-A under test. With the INPUT control set at maximum and an input of 0.1 volts at 2500 cycles, the OUTPUT meter of the Type 1107-A under test must read off scale.

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1.0. General

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